

## **Optimization & Time Horizon: Striking a Better Balance**

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- Review of the inputs of Modern Portfolio Theory (MPT):
  - Risk
  - Correlations
  - Returns
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## 2008 – A Year for the History Books

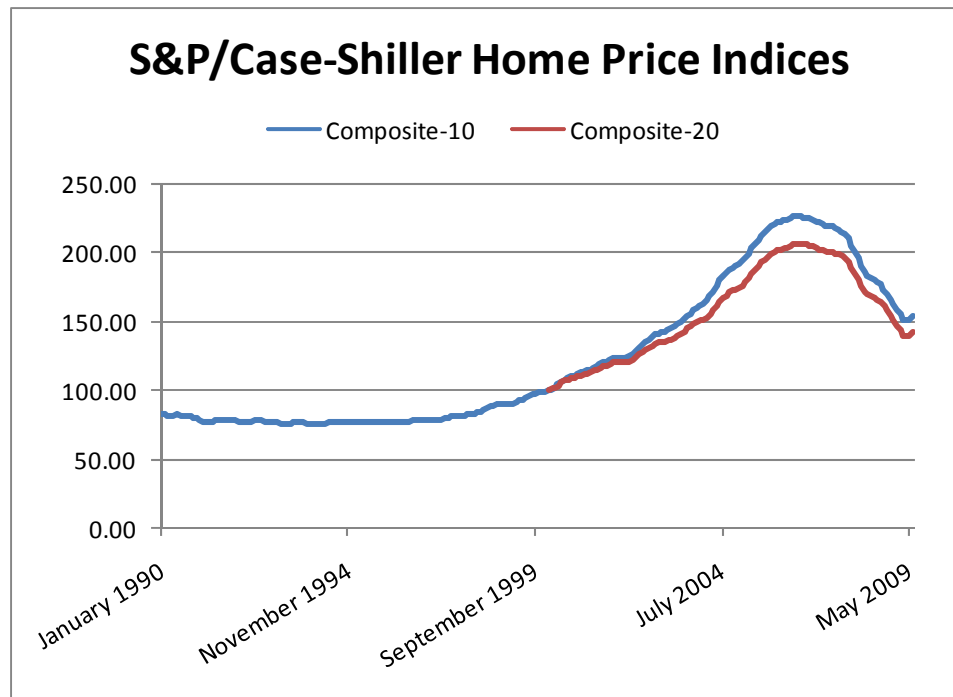
- 2008, by any measure, was a historic year
  - Unregulated derivatives trading and downfall of leveraged structured investment products
    - Bear Stearns, March 2008
    - Lehman Brothers, September 2008
  - Staggering degrees of fraud
    - Madoff, December 2008
    - Stanford, February 2009
  - Spurred on by these failures and scandals, the markets took precipitous falls

### 2008 Returns

| S&P 500       | Russell 3000  | MSCI EAFE     | MSCI World    | BC Aggregate |
|---------------|---------------|---------------|---------------|--------------|
| <b>-37.0%</b> | <b>-37.3%</b> | <b>-43.1%</b> | <b>-40.3%</b> | <b>5.2%</b>  |

## 2008 – The Double Whammy

- In times past, investors, when hit by adverse markets, have been able to retreat into the security of real estate
  - Not so this time around – real estate was the driver
- Naked leverage, confused with investment “innovations” in the mortgage market, was the main driver in the financial market meltdowns
- The insecurity in the financial markets then further dampened the real estate markets, creating a negative looping effect



## 2008 – The Troubled Masses

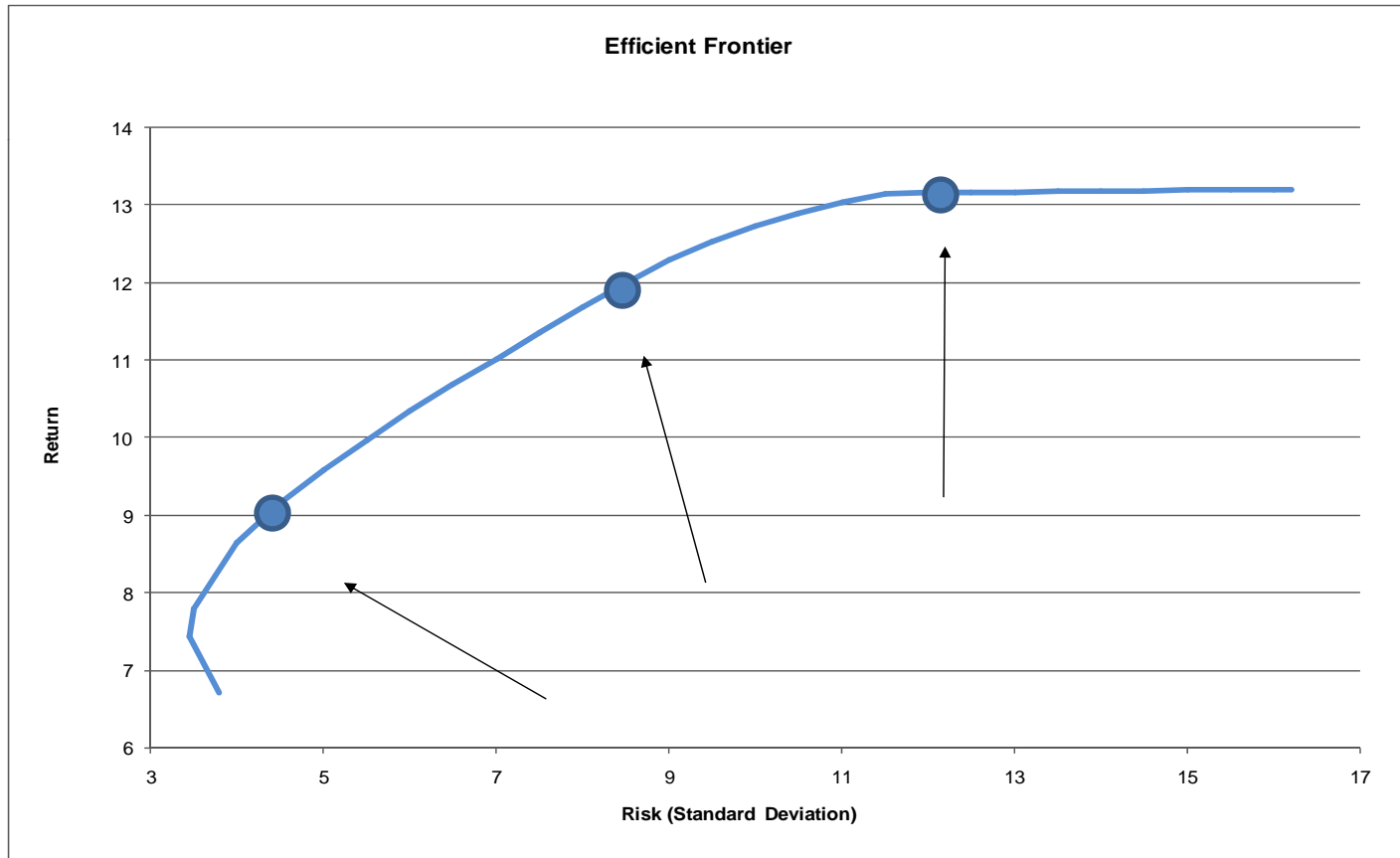
- In 2008, the Federal Reserve estimates that total household wealth dropped \$11.1 trillion, or 18 percent <sup>1</sup>
- The Census Bureau estimates that the baby boomer generation makes up 25% percent of the U.S. population – the boomers began retiring in 2006
- The Congressional Budget Office, in their **2007** Economic and Budget Issue Brief titled “The Retirement Prospects of the Baby Boomers” worried **then** that “boomers [were] not accumulating enough private savings to finance their retirement”
- After the firestorm of 2008, one can only begin to speculate as to the retirement prospects of the boomer generation....

## Making Sense of Catastrophe

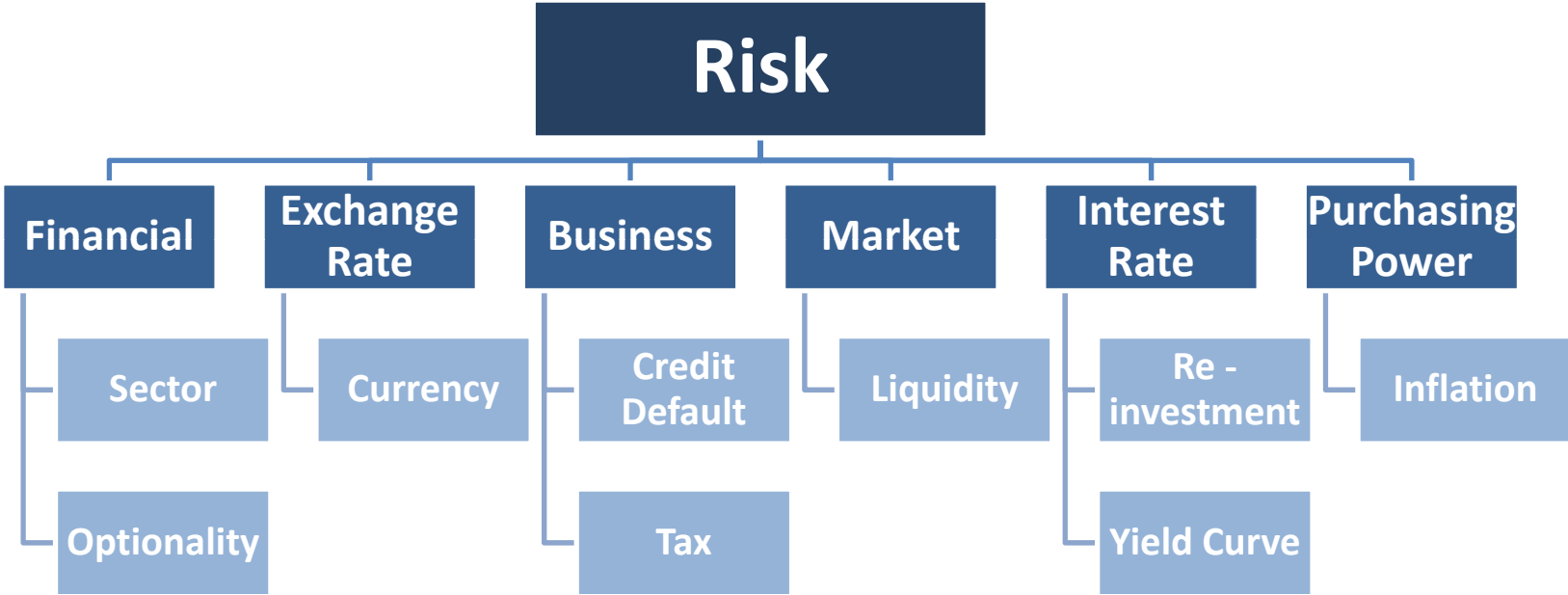
- Investing in this century and for the latter half of the 20<sup>th</sup> was largely governed by **Modern Portfolio Theory (MPT)**
- MPT allows an individual to build an efficient frontier of possible portfolios in which, for a desired level of risk, the potential return is maximized (mean variance optimization)
- MPT requires several inputs:
  - Volatility (Standard Deviation) of the asset returns
  - Correlations between the different asset returns
  - Asset Returns
- In essence, by diversifying into low correlation assets, an investor can maintain a high level of return while reducing the risk associated with that level of return

## The Efficient Frontier

- The most commonly used graphic representations of MPT - the **efficient frontier**
- Each point represents a portfolio with the maximum return for a specified level or risk



# Sources of Risk



## Assessing Risk

- Most clients expect a return target of 8% over the long term
- Average annual returns and period annualized returns as of 2008:

| Barclays Aggregate |         |          |          |
|--------------------|---------|----------|----------|
|                    | 5 Years | 10 Years | 20 Years |
| Annualized         | 4.7%    | 5.6%     | 7.4%     |
| Average Annual     | 4.7%    | 5.7%     | 7.6%     |

| S&P 500        |         |          |          |
|----------------|---------|----------|----------|
|                | 5 Years | 10 Years | 20 Years |
| Annualized     | -1.1%   | -0.8%    | 8.6%     |
| Average Annual | 0.7%    | 1.0%     | 10.4%    |

| MSCI EAFE      |         |          |          |
|----------------|---------|----------|----------|
|                | 5 Years | 10 Years | 20 Years |
| Annualized     | 4.4%    | 2.3%     | 4.1%     |
| Average Annual | 7.4%    | 5.2%     | 6.1%     |

- The process of annualizing the returns of certain periods always results in a lower return number
  - This is the result of **volatility**

## Everyone Returns 8% Eventually, Right?

- Volatility is period specific
- Historical probabilities that particular period lengths have met return targets using the monthly return data of the S&P 500 Index since 1950:

|     | Periods |            |     |            |
|-----|---------|------------|-----|------------|
|     | 5       | 10         | 15  | 20         |
| 2%  | 78%     | 85%        | 93% | 100%       |
| 4%  | 71%     | 77%        | 74% | 81%        |
| 6%  | 62%     | 66%        | 64% | 63%        |
| 8%  | 51%     | <b>53%</b> | 52% | <b>39%</b> |
| 10% | 37%     | 39%        | 27% | 19%        |
| 12% | 25%     | 15%        | 11% | 10%        |
| 14% | 18%     | 8%         | 7%  | 1%         |
| 16% | 13%     | 2%         | 1%  | 1%         |
| 18% | 8%      | 1%         | 2%  | 2%         |
| 20% | 6%      | 2%         | 2%  | 2%         |

- **Average returns are not so average for many periods of time!**

## Assessing Volatility in a Not So Average World

- Risk as period volatility or standard deviation of returns is not enough
  - Entry timing and period length are also key factors of risk
- Actual returns received could be, and probably will be, vastly different from average returns
- Investors need to be made aware of these **additional risks**
  - **They emphasize the very real potential for non-average results**
- In light of these additional risks, investors' choices might be very different

## Timing is Everything – A Retirement Example

- It is possible to retire at the “wrong” time
  - Asset Returns
  - Inflationary Pressures
  - Volatility

|                                     | Retiree A  | Retiree B  |
|-------------------------------------|--|--|
| <b>Retires</b>                      | 1976   | 1985   |
| <b>Average U. S. Wage</b>           | \$9,799  | \$16,823   |
| <b>Max Social Security Benefits</b> | Yes  | Yes  |
| <b>Savings</b>                      | 3x Final Salary                                  | 3x Final Salary                                  |
| <b>Investments</b>                  | 60% Equity (S&P 500)/<br>40% Fixed Inc. (BC Agg) | 60% Equity (S&P 500)/<br>40% Fixed Inc. (BC Agg) |
| <b>Replacement Income</b>           | 78%  | 78%  |
| <b>Longevity Risk</b>               | 20 Years   | 20 Years   |

## Timing is Everything – Continued

- The individual fortunate enough to have retired in 1985 will end their retirement with a sizeable balance while the individual unlucky to have retired in 1976 will end their retirement with a sizeable negative balance!

Individual Retiring in 1976

|    | Year | Returns | Inflation | Balance       |
|----|------|---------|-----------|---------------|
| 1  | 1976 | 20%     | 0%        | \$28,493.07   |
| 2  | 1977 | -3%     | 6%        | \$22,310.43   |
| 3  | 1978 | 4%      | 8%        | \$17,899.99   |
| 4  | 1979 | 12%     | 11%       | \$14,341.18   |
| 5  | 1980 | 20%     | 14%       | \$12,891.94   |
| 6  | 1981 | 0%      | 10%       | \$8,749.90    |
| 7  | 1982 | 25%     | 6%        | \$7,176.90    |
| 8  | 1983 | 17%     | 3%        | \$4,803.01    |
| 9  | 1984 | 10%     | 4%        | \$1,616.27    |
| 10 | 1985 | 27%     | 4%        | (\$208.97)    |
| 11 | 1986 | 17%     | 2%        | (\$2,396.10)  |
| 12 | 1987 | 5%      | 4%        | (\$4,779.63)  |
| 13 | 1988 | 13%     | 4%        | (\$7,705.54)  |
| 14 | 1989 | 25%     | 5%        | (\$11,954.65) |
| 15 | 1990 | 2%      | 5%        | (\$13,138.48) |
| 16 | 1991 | 24%     | 4%        | (\$17,240.32) |
| 17 | 1992 | 7%      | 3%        | (\$19,327.19) |
| 18 | 1993 | 10%     | 3%        | (\$22,034.71) |
| 19 | 1994 | 0%      | 3%        | (\$22,725.72) |
| 20 | 1995 | 30%     | 3%        | (\$28,804.35) |

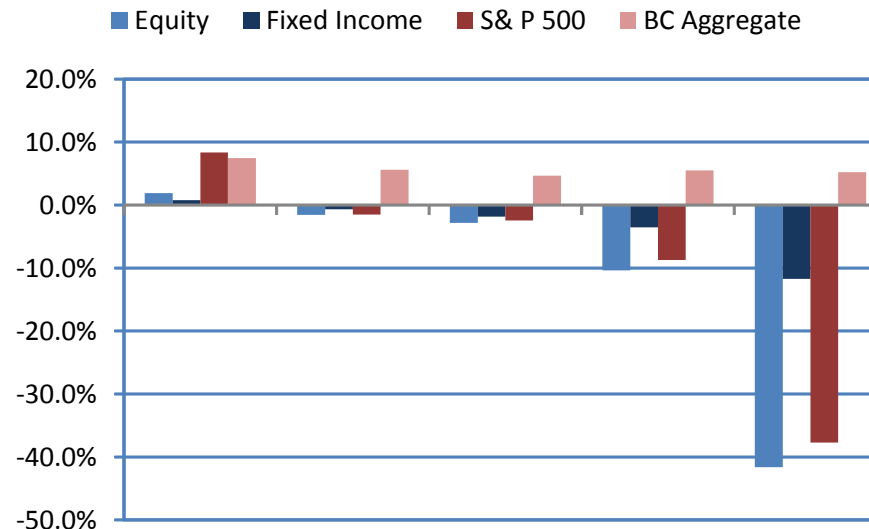
Individual Retiring in 1985

|    | Year | Returns | Inflation | Balance     |
|----|------|---------|-----------|-------------|
| 1  | 1985 | 27%     | 0%        | \$53,572.86 |
| 2  | 1986 | 17%     | 2%        | \$54,610.01 |
| 3  | 1987 | 5%      | 4%        | \$48,652.20 |
| 4  | 1988 | 13%     | 4%        | \$46,483.64 |
| 5  | 1989 | 25%     | 5%        | \$49,324.81 |
| 6  | 1990 | 2%      | 5%        | \$42,938.91 |
| 7  | 1991 | 24%     | 4%        | \$46,344.51 |
| 8  | 1992 | 7%      | 3%        | \$42,872.21 |
| 9  | 1993 | 10%     | 3%        | \$40,194.25 |
| 10 | 1994 | 0%      | 3%        | \$33,176.26 |
| 11 | 1995 | 30%     | 3%        | \$37,584.77 |
| 12 | 1996 | 15%     | 3%        | \$37,799.19 |
| 13 | 1997 | 24%     | 2%        | \$41,399.83 |
| 14 | 1998 | 20%     | 2%        | \$45,488.05 |
| 15 | 1999 | 12%     | 2%        | \$46,722.50 |
| 16 | 2000 | -1%     | 3%        | \$42,935.89 |
| 17 | 2001 | -4%     | 3%        | \$38,334.21 |
| 18 | 2002 | -9%     | 2%        | \$32,265.25 |
| 19 | 2003 | 19%     | 2%        | \$35,928.53 |
| 20 | 2004 | 8%      | 3%        | \$36,853.93 |

## Reality Check

- Generally, assume that investors make “ideal” decisions when investing
- DALBAR’s Quantitative Analysis of Investor Behavior 2009 Study (QAIB) examined mutual fund investor behavior over the last 20 years
- Average returns for mutual fund equity investments, fixed income investments, and the common benchmarks:

As of December 31, 2008:



|              | 20 Years | 10 Years | 5 Years | 3 Years | 1 Year |
|--------------|----------|----------|---------|---------|--------|
| Equity       | 1.9%     | -1.6%    | -2.8%   | -10.4%  | -41.6% |
| Fixed Income | 0.8%     | -0.7%    | -1.8%   | -3.6%   | -11.7% |
| S& P 500     | 8.4%     | -1.5%    | -2.4%   | -8.7%   | -37.7% |
| BC Aggregate | 7.4%     | 5.6%     | 4.7%    | 5.5%    | 5.2%   |

## Correlation

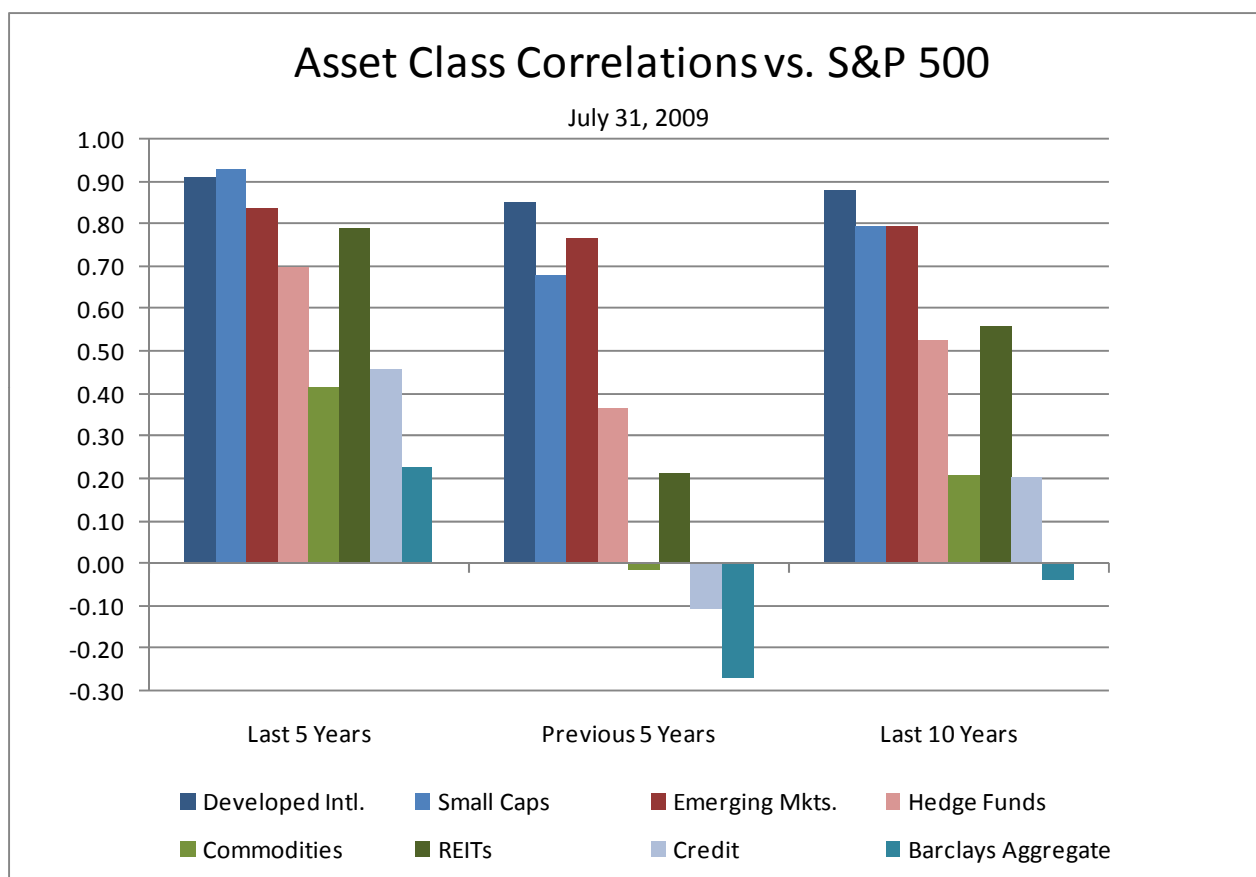
- Correlation measures how two asset classes move in relation to each other
  - The correlation coefficient ranges from -1 to 1
  - 1 means that two assets move in tandem
  - 0 means that there is no relationship in movement
  - -1 means that they move in opposite directions
- In order to create a more efficient portfolio, MPT dictates that a portfolio should be made of asset classes that are not highly correlated
- This creates a hedge for different market environments
  - If one asset is down, another asset (if it has low correlation) may be down less or (if it is negatively correlated) even up

## Assessing Correlation

- Correlation, however, bears further scrutiny because of the following issues:
  - Correlation is very period dependent
  - Correlation is not a predictor of performance
  - Correlation is becoming less relevant with the impact of globalization
  - Correlation tends to break down during market stress
- **Past correlation is not a predictor of future correlation!**

## Time Period is Everything

- Correlation is very sensitive to time period selection



- Commodities have been positively correlated with the S&P 500 for the last 5 years, but negatively correlated for the 5 years prior to that
- What does this mean for the next 5 – 10 years?

## Correlation – An Example

- Using efficient frontier generator, created two portfolios that both met return objective of 11% over 25 years
  - Portfolio could consist of BC Aggregate, MSCI EAFE and S&P 500
  - Scenario 1 - 25 year returns, 25 year standard deviations and **25 year correlations**
  - Scenario 2 - 25 year returns, 25 year standard deviations and **10 year correlations**

|                   | 25 Year Correlation | 10 Year Correlation |
|-------------------|---------------------|---------------------|
| S&P 500/MSCI EAFE | 0.65                | 0.98                |

- The optimal portfolios:

|              | 25 Year Correlation | 10 Year Correlation |
|--------------|---------------------|---------------------|
| S&P 500      | 46%                 | 0%                  |
| MSCI EAFE    | 29%                 | 63%                 |
| BC Aggregate | 25%                 | 37%                 |

- Depending on the correlation selected, the S&P 500 allocation could be 0 or half the portfolio!

## Is Correlation Useful?

- High correlation predicts that two asset classes generally move in the same direction - it says nothing of the **magnitude** or **volatility** of these moves
- As of July 31, 2009, Developed International Equities had a 10 year correlation of 87.65% with the S&P 500 and Emerging Market Equities a 79.40% correlation – they are highly correlated with the S&P 500
- However, their performance history has been very different...

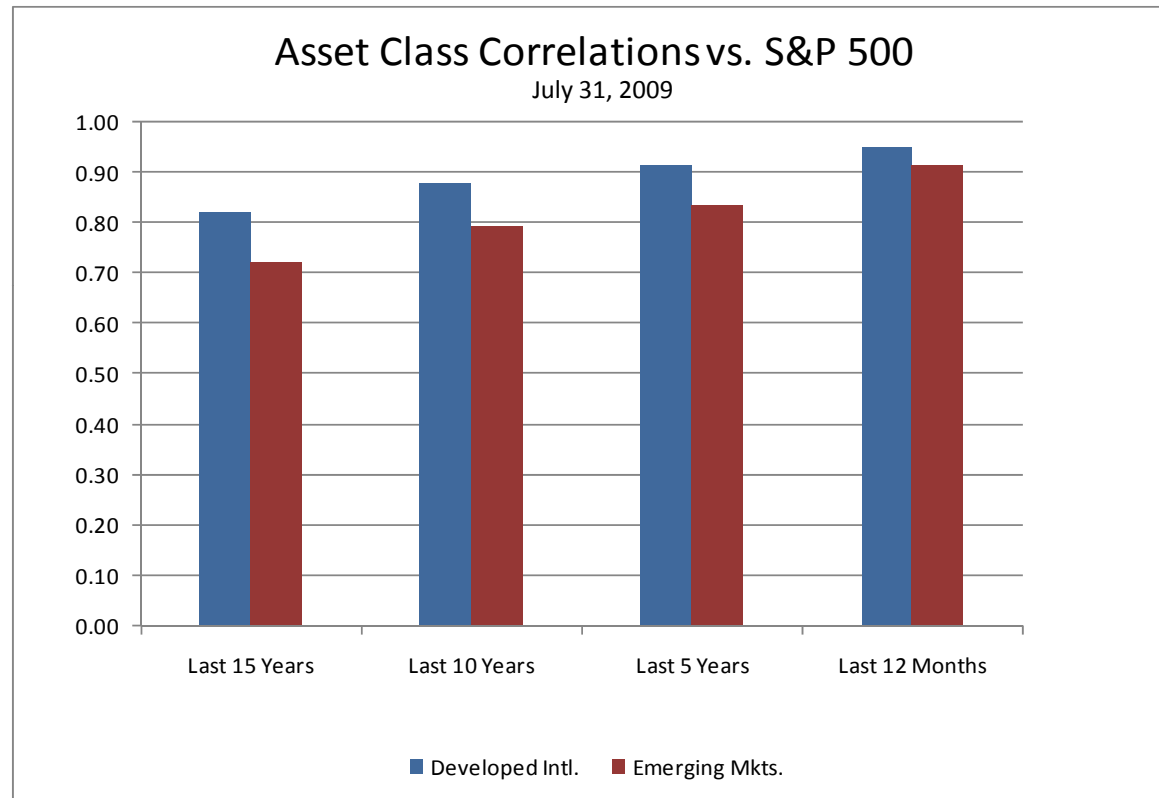
### Annualized Returns

July 31, 2009

|           | 10 Year | 5 Year | 1 Year |
|-----------|---------|--------|--------|
| MSCI EAFE | 2.2%    | 5.3%   | -22.2% |
| MSCI EM   | 10.5%   | 18.0%  | -16.6% |
| S&P 500   | -1.2%   | -0.1%  | -20.0% |

## Globalization...

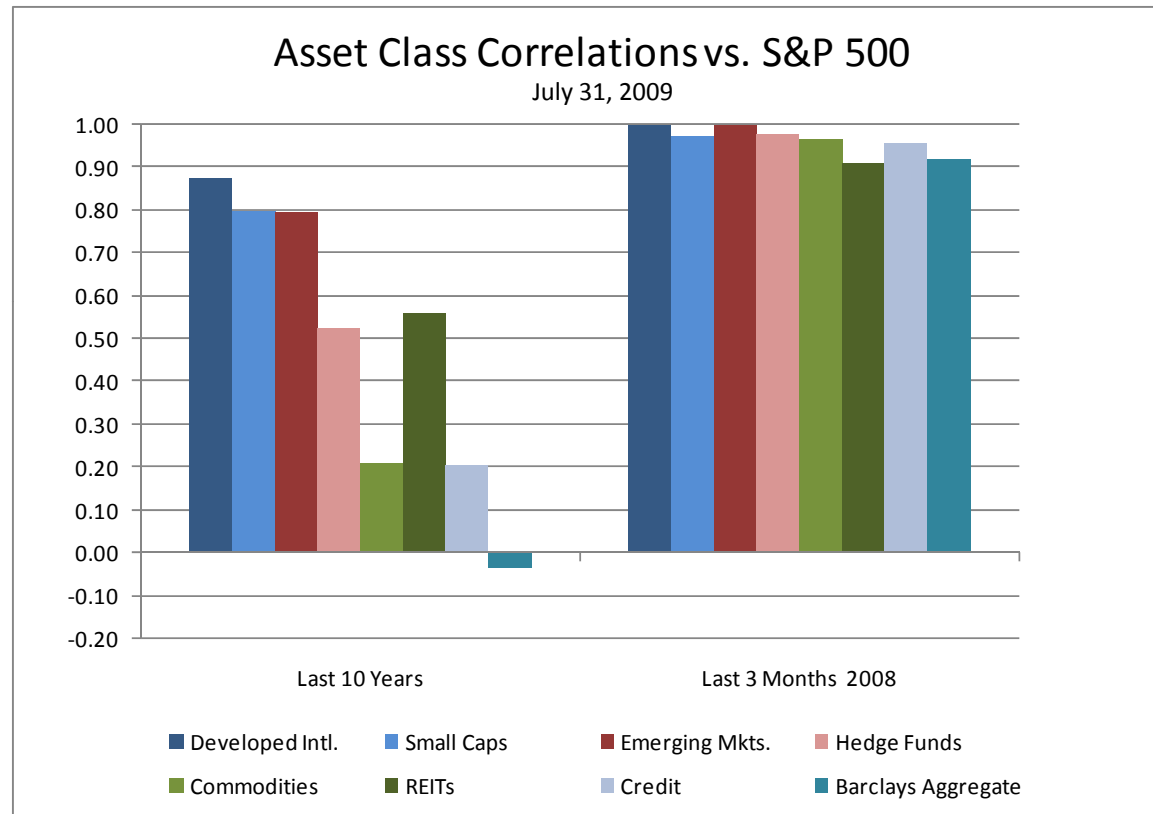
- Increased globalization has resulted in higher correlations between domestic and international asset classes



- As correlations become higher, diversification stops protecting against general market risks

## General Catastrophe

- Globalization has caused greater linkage between all financial markets and reduced asset return independence



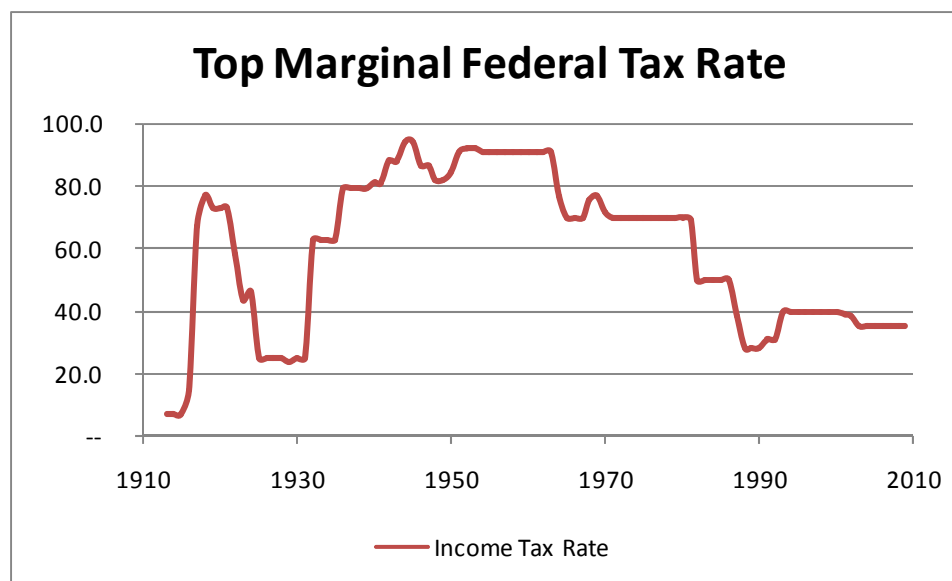
- **“The only thing that goes up in a market crash is correlation”**  
Diversification tends to desert us when we need it most!

## Correlation

- Correlation is a tool that is useful in **certain** contexts
- An investor should be aware of:
  - Period selection
  - Underlying performance movements
  - The trends in correlations
  - Break-downs in certain market environments
- Risk is very difficult to quantify – diversification alone does not mitigate against all risks

## Returns – Gross v. Net

- Returns are generally reported gross of fees, expenses, and taxes
  - For our purposes, net returns will take into account the effect of taxation only
- Utilizing gross returns has large repercussions on assumptions regarding:
  - Asset selection
  - Risk preference
  - Wealth preservation
- Especially considering the magnitude of taxes



## The Precarious Tax Structure

- Recession has negatively impacted the country's balance sheet
  - Deficit looms large at \$1.3 trillion; national debt at over \$11 trillion
  - All of this debt has to be paid somehow - repayment will partly come in the form of higher taxes
- Proposed tax rates to revert to Clinton era - highest bracket at 39.6%
- For many, Federal taxes are just the beginning:
  - State taxes
  - Medicare/Social Security
  - Potential Healthcare Surtax

|               | Avg. Top Local Rate | Top State Rate ('11) | Top Fed Rate | Medicare Tax | Potential Surtax | Potential Combined Rate |
|---------------|---------------------|----------------------|--------------|--------------|------------------|-------------------------|
| Oregon        | 0.4%                | 11.0%                | 39.6%        | 2.9%         | 5.4%             | 57.5%                   |
| Hawaii        | 0.0%                | 11.0%                | 39.6%        | 2.9%         | 5.4%             | 57.2%                   |
| California    | 0.0%                | 10.3%                | 39.6%        | 2.9%         | 5.4%             | 56.6%                   |
| Rhode Island  | 0.0%                | 9.9%                 | 39.6%        | 2.9%         | 5.4%             | 56.2%                   |
| New York City | 3.7%                | 9.0%                 | 39.6%        | 2.9%         | 5.4%             | 58.7%                   |

## Tax-Adjusted Returns – An Example

- Assume

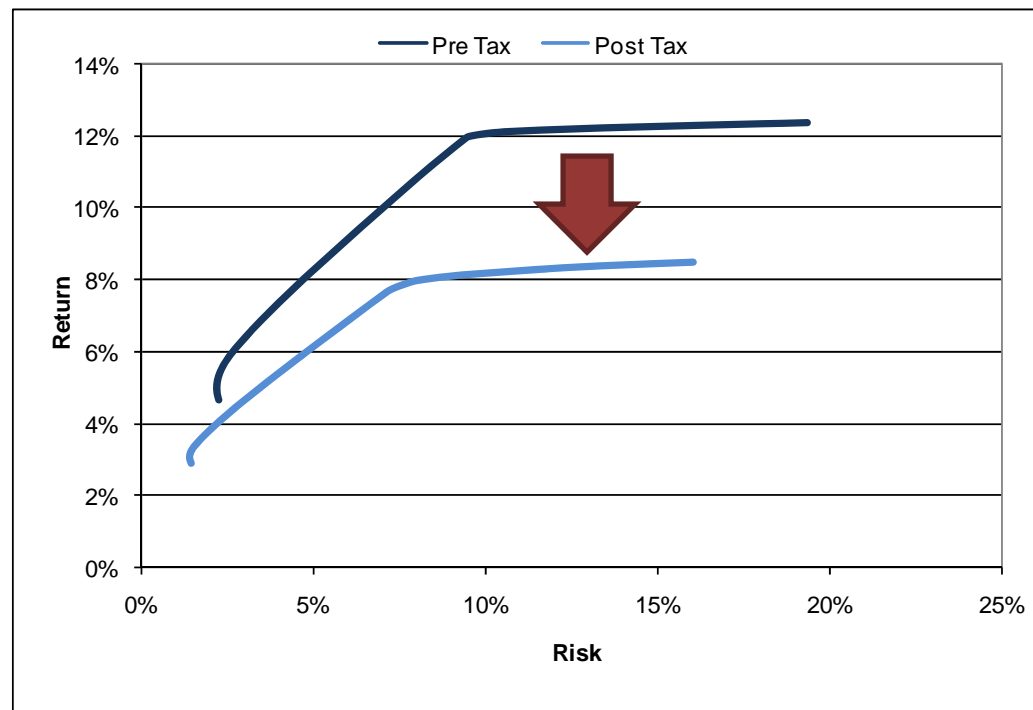
- Married, filing jointly
- Income of \$1,000,000
- Qualified Capital Gains (ignore capital loss carry forward limits)
- All income taxed at highest marginal rate
- Holds a diversified set of securities in each asset class

- 9 different possible asset classes, with 25 years of returns as of December, 2008 benchmarked against the following:

- BC Aggregate
- MSCI EAFE
- 3 Month Treasury Bill
- NAREIT
- DJIA
- S&P 500 500
- 30 Year Treasury Bond
- BC Long Muni
- Russell 2000

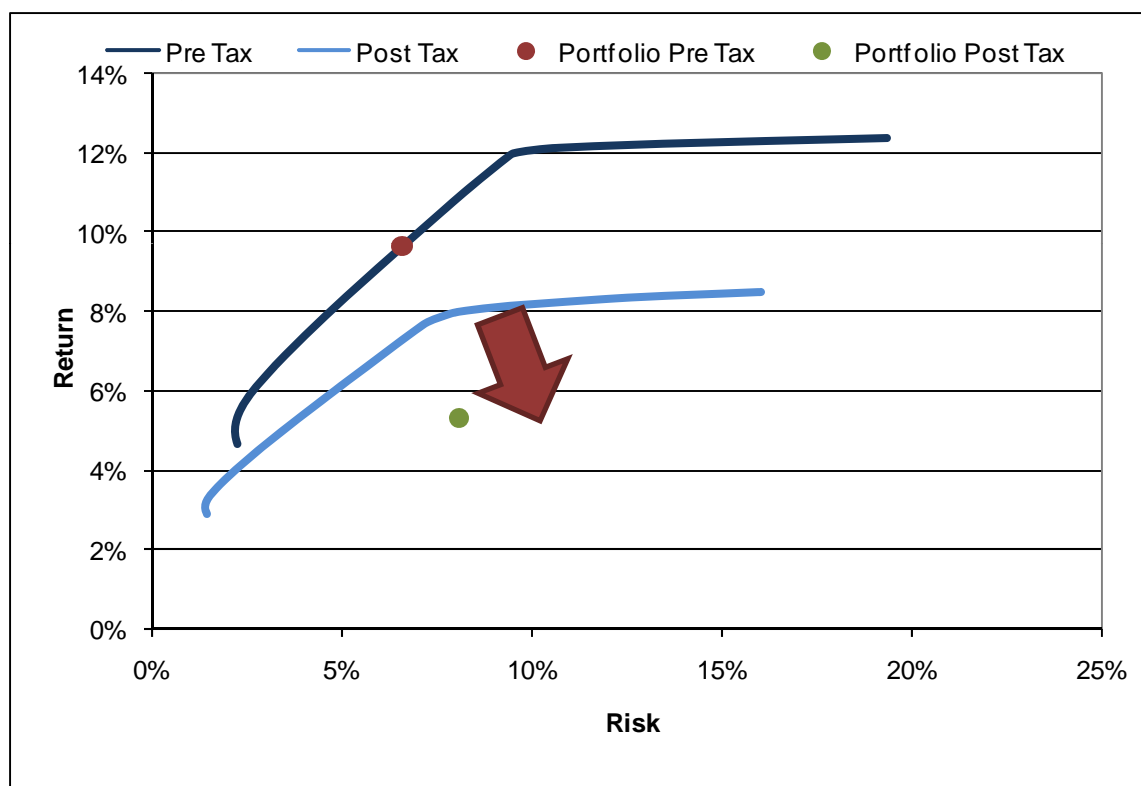
## Tax Inefficiencies

- The efficient frontier demonstrates the inefficiencies of employing gross returns when developing portfolio asset allocations, as taxes are applied:
  - **First**, returns along all levels of risk are reduced
  - **Second**, the range/ magnitude of possible levels of risk are reduced
  - **Third**, inefficient allocations occur if an investor selects asset classes based on gross return numbers, instead of tax-adjusted numbers



## The Sharpe Ratio and Efficient Frontiers

- The most risk efficient portfolio allocation found using gross numbers (ie, the one with the highest Sharpe Ratio), is wholly inefficient when the returns are tax adjusted:



- Maximizing the Sharpe Ratio for any portfolio will give an investor the “biggest bang for his buck”

## The Sharpe Ratio

- More on the Sharpe Ratio....
- The Sharpe Ratio is helpful in identifying the point on an efficient frontier that contains the most optimal asset allocation from a risk-adjustment perspective
  - An investor may find that a higher/lower level of risk is appropriate
- The Sharpe Ratio is calculated as follows:

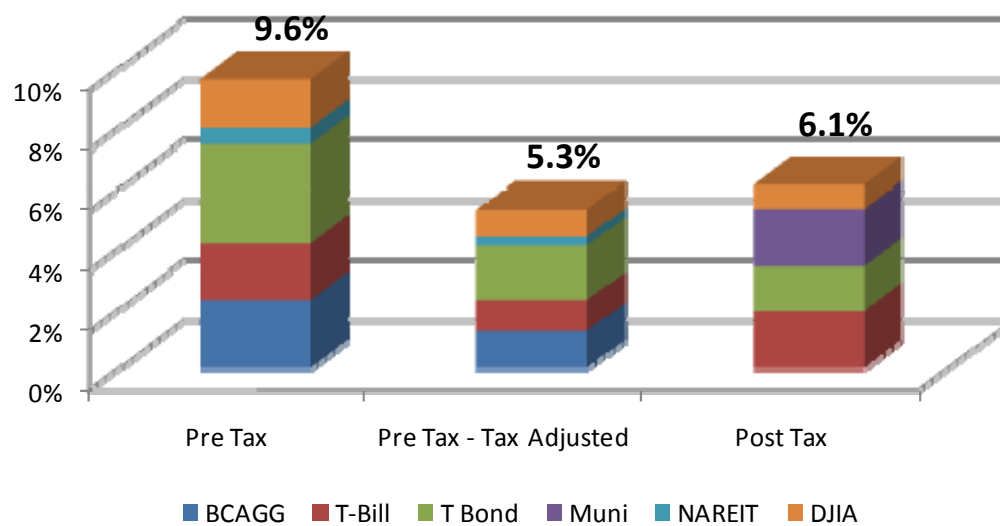
$$\text{(Portfolio Return – Risk-Free Return) / Portfolio Risk}$$

- The Sharpe Ratio essentially measures the excess return generated by a portfolio for each unit of risk
- Maximizing the Sharpe Ratio for any portfolio will optimize the level of risk for the portfolio from a certain perspective

## Asset Relocation

- The optimal allocation changes completely when the returns are tax adjusted

|        | Pre Tax | Pre Tax - Tax Adjusted | Post Tax |
|--------|---------|------------------------|----------|
| Return | 9.6%    | 5.3%                   | 6.1%     |
| Risk   | 6.6%    | 8.1%                   | 5.0%     |
| BCAGG  | 24%     | 24%                    | 0%       |
| T-Bill | 19%     | 19%                    | 32%      |
| T Bond | 34%     | 34%                    | 24%      |
| Muni   | 0%      | 0%                     | 31%      |
| NAREIT | 6%      | 6%                     | 0%       |
| DJIA   | 17%     | 17%                    | 13%      |



## Wealth Preservation

- Municipal bonds offer tax efficiencies above and beyond other asset classes
  - Interest income is exempt from federal income tax

Annual Returns 1983-2008

|         | Gross Average<br>Return | Net Average<br>Return | % Preserved |
|---------|-------------------------|-----------------------|-------------|
| BC Agg  | 8.6%                    | 5.2%                  | 61%         |
| EAFE    | 12.4%                   | 8.6%                  | 69%         |
| S&P 500 | 11.4%                   | 7.6%                  | 66%         |
| T-Bill  | 4.6%                    | 2.9%                  | 62%         |
| T-Bond  | 11.9%                   | 7.6%                  | 64%         |
| Muni    | 8.0%                    | 7.3%                  | 91%         |
| NAREIT  | 9.6%                    | 4.7%                  | 49%         |
| R2000   | 9.7%                    | 6.2%                  | 64%         |
| DJIA    | 12.3%                   | 8.4%                  | 69%         |

- For the tax-sensitive investor, using net v. gross returns could have a large impact – building **spendable wealth**

## MPT in Sum

- MPT, though a valuable financial tool, is not without its drawbacks.
- Specifically, the inputs of MPT should bear closer scrutiny:
  - Volatility as Risk
  - Correlation Selection
  - Gross Returns
- Additionally, the application of MPT has been troublesome
  - Long term allocations that are merely rebalanced
  - Unclear money usage goals
  - Psychological inclinations of investors

## Investor Decision Making

- DALBAR has found that investors tend to make decisions on some of the following bases<sup>1</sup>:

- **Narrow Framing** – making decisions without considering all the implications

- **Anchoring** – relating to familiar experiences, even when inappropriate

- **Diversification** – seeking to reduce risk by simply using different sources, giving no thought to how such sources interact

- **Herding** – copying the behavior of others even in the face of unfavorable outcomes

- Recognizing these impediments and the incompleteness of MPT, the financial industry began formulating other options

- Target Date Funds

- Life Cycle Funds

## Liability Driven Investing (LDI)

- In the institutional world, LDI is a means for dynamically designing and managing portfolios within the context of the structure of an institution's liabilities – they represent the key investment target and risk factor
- The liabilities can be
  - pension benefits
  - insurance claims
  - corporate cash management
  - endowment/foundation spending goals
- LDI offers an ongoing **process** and **framework** for understanding the risks of a liability based institution
- Pension funds that used LDI outperformed funds with traditional asset allocations in 2008 by a significant margin<sup>1</sup> – the LDI strategy broke even while the traditional asset strategy suffered a 25% loss

## Purpose-Based Asset Management (PBAM)

- Purpose-Based, Mission-Driven or Goal-Based Investing are all examples of the retail world borrowing from the institutional playbook
- PBAM was pioneered off of the successes and failures of the target-date concept
- Essentially, PBAM recognizes that all assets are accumulated for some purpose:
  - Retirement Expenses
  - Healthcare
  - College Education
  - Bequests
- **Funding these goals** is much more important to an investor than just overall **asset growth for asset growth's sake**

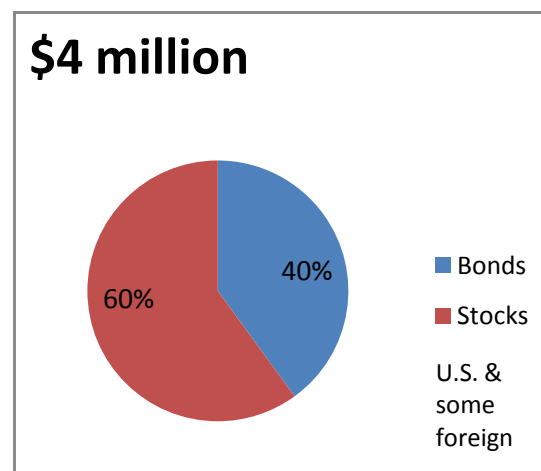
## PBAM – An Example

- Consider a retiree who is 65 years old who expects to live in retirement for 20 years
- Assume the retiree investor requires annual retirement replacement income of \$100,000
  - indexed to inflation
  - in addition to Social Security and pension
- Two sets of goals
  - Cover general living expenses with high degree of certainty
  - Cover other goals, such as foreign travel or bequests to their alma mater
- The investor has amassed \$4 million in retirement savings

## Traditional Investing

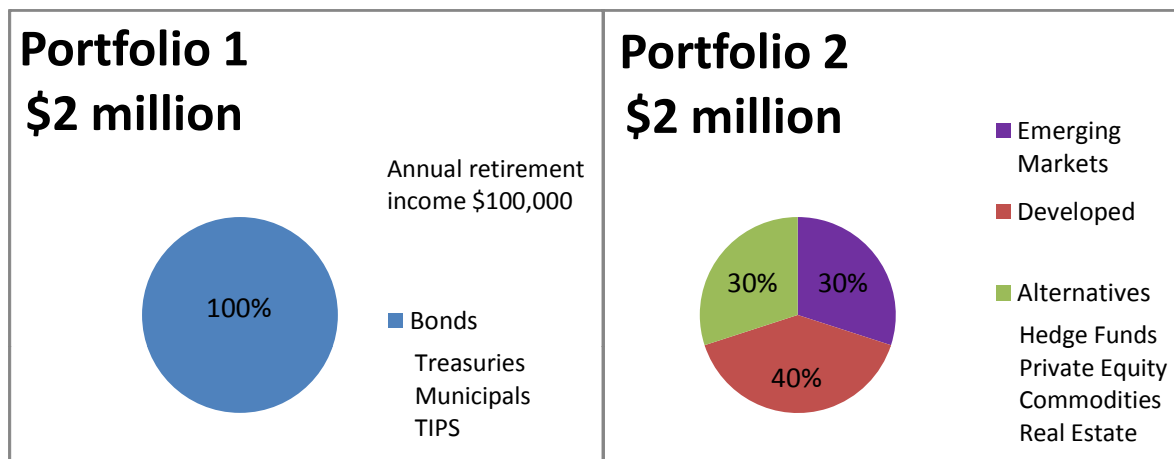
- In traditional retirement investing, a simple collection of bonds serves as ballast for stocks
- The investor hopes that this mix will produce enough income in retirement
- This type of portfolio is subject to all of the issues we discussed in the beginning of our presentation:
  - Time period and high volatility risk
  - Correlation breakdowns
  - Tax Risk

### Traditional Investing



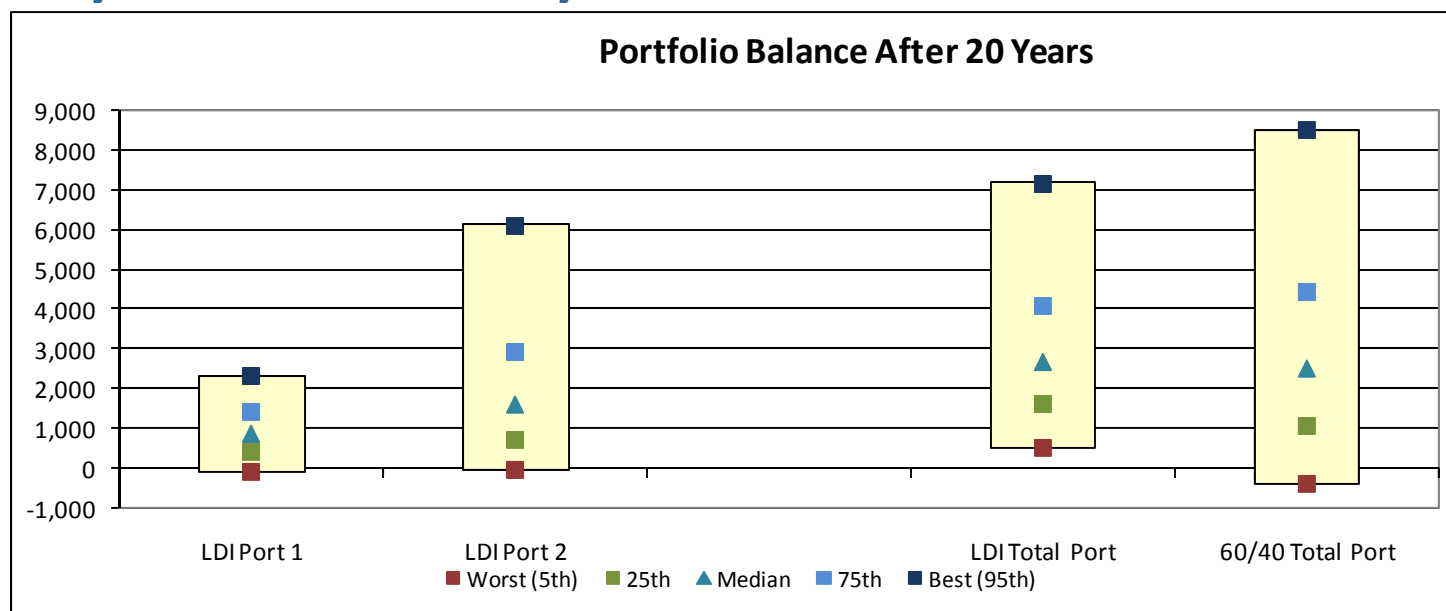
# PBAM – LDI for the Little Guy

## Liability Driven Investing



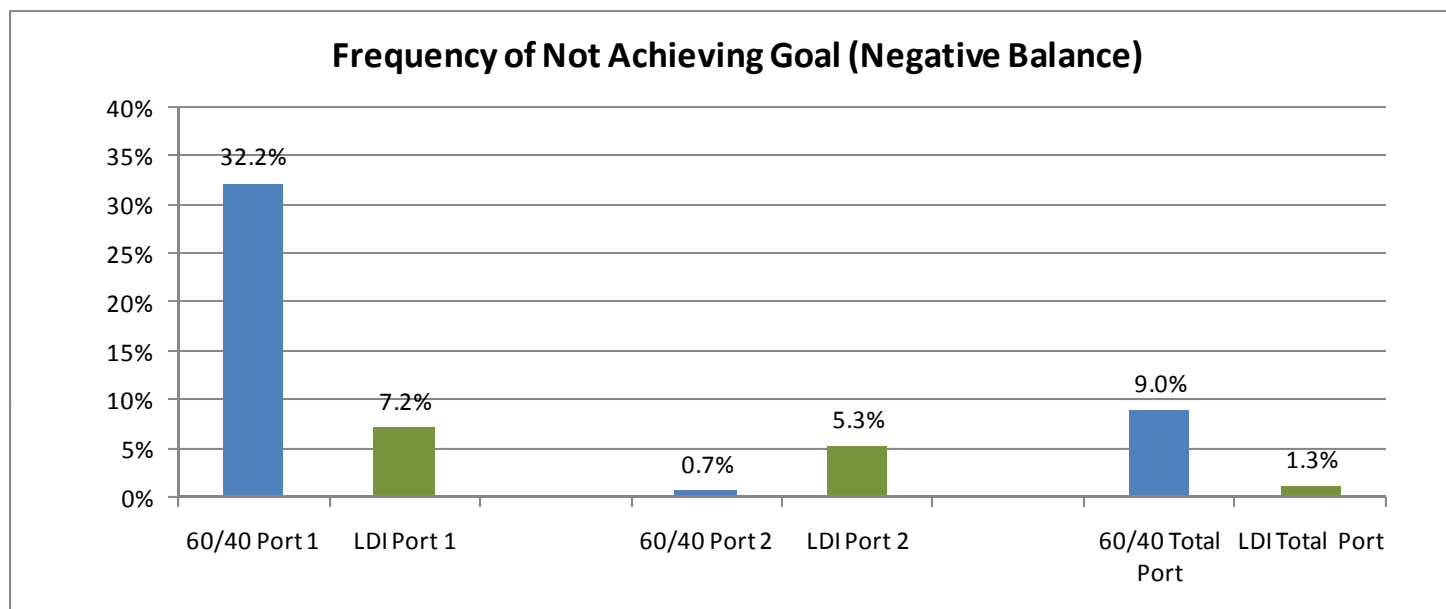
- Fixed income portfolio produces dependable return to cover \$100,000 annual retirement and healthcare expenses
  - Volatility risk, dependence on correlation, and tax risk have all been minimized
- A second, more aggressive portfolio funds the less necessary foreign travel and bequest expenditures
  - These \$500,000 expenditures are expected to occur every 5 years

## It Pays to be Risk Savvy



- The LDI strategies minimize risk where it is appropriate to do so
  - The retirement portfolio (LDI Port 1) has less volatility in terms of achieving the investor's goals – preservation of income
  - The discretionary portfolio (LDI Port 2) has taken on more risk to potentially maximize the investor's secondary goals – bequests, etc.
- The traditional strategy does not differentiate between the investor's goals – the volatility associated with the portfolio balance is accordingly very large

## Risk Where You Really Need It



- If the investor were to simply split the traditional strategy into two portfolios, he would still experience a large amount of downside risk with respect to his retirement income
  - Dividing is not differentiating!
- The LDI strategy reduces the probability of having to rethink the investor's retirement goals by minimizing the potential for negative account balances

## Conclusion

- 2008 was a time of great financial calamity - highlighted fragile nature of many investor's portfolios
  - Baby boomer generation – what are they going to retire on?
- MPT is a useful tool for examining the interactions of asset classes over time and it provides a means for developing narrowly optimal portfolios
- However, its inputs – volatility, correlation, and returns – should be subject to greater scrutiny and understanding
  - The world is much riskier than commonly assumed – time period, entry, correlation, and tax are some of these additional risks
- Finally, the application of MPT as the sole means of an investment process has led many astray
- LDI for the individual investor is perhaps the next step
  - A logical extension to accurately align an investor's assets with his goals to counteract the many hidden risks of the markets